First of a Series on

DESERT LIFE

# LOCATION OF DESERTS

*by*

ANNE STROMQUIST

*Raymond Foundation*

Museum Stories, Number 245

March 7, 1953

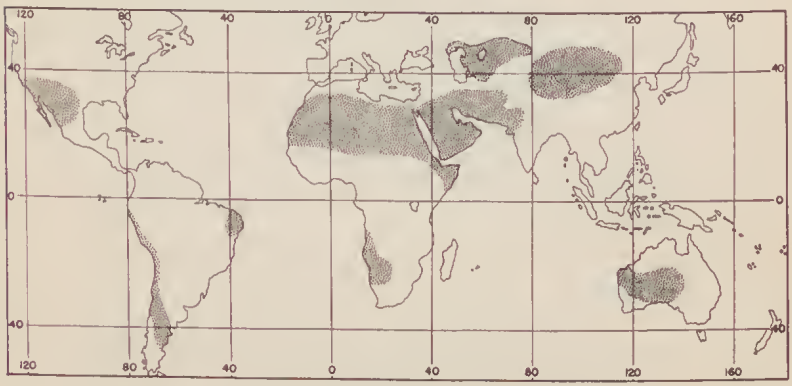
# Location of Deserts

Millions of different living things thrive on our planet and yet regions called deserts, where life is a hard and terrible struggle for survival, make up a great part of the earth's land-surfaces. Any place that is a dry wasteland and almost barren of life might be called a desert. Most of the desert regions of the world are found in a great belt about twenty-five degrees north and south of the equator. These are the hot dry areas that most people think of when they talk about the desert.

The Sahara, which lies in a belt north of the equator, is probably the most famous of all deserts. It is the western end of a tremendous tract of desert country that starts at the Atlantic Ocean, extends 3,200 miles across North Africa to the Red Sea, and then continues through Arabia and Iran to India. Just north of Iran lies the great desert of Kara Kum in the U.S.S.R., and east of it is the vast Gobi Desert in Mongolia.

The Sahara is not only the best known of all the desert regions in the world but it is also one of the biggest. It covers about three and one-half million square miles, which is about the size of the continent of Europe not counting Scandinavia. In the southern hemisphere, desert covers about one-third of the continent of Australia. Here ocean winds carrying a great deal of moisture blow toward the

SHADED AREAS ARE DESERT LAND



east coast of Australia. As the winds travel inland from the coast they must cross a range of mountains. As the air goes up the mountain sides it gets cooler. Cold air cannot hold as much moisture as warm air and so some of the moisture forms into raindrops that fall to the ground. In this way the winds in their journey upward over the mountains lose most of their rain. The little moisture that is left falls on grassland on the other side of the mountains. Then there is no more rain, and that is why a large part of the interior of Australia is a desert. Often mountain ranges that block moisture-laden wind cause desert region on their leeward sides. The deserts in our

own Southwest came about in this way. Winds from the Pacific Ocean bump into the Sierra Nevada and Cascade mountain chains along our west coast and dump their moisture as rain as they go up the mountain sides. On the other side of the mountains in parts of Washington, Oregon, Nevada, Utah, and western Colorado is a semidesert region called the intermontane plateaus.

Besides semidesert there are vast stretches of land in the United States with just as true desert conditions as are found in the Sahara. The driest lie in the same desert belt as the Sahara on the other side of the world. They are the Mohave and Colorado deserts of California and the Sonoran Desert of Arizona and New Mexico.

Although some animals and plants have been able to make the desert their home, these regions are not settled by people. For this reason desert regions in the United States have been used for trying out new and dangerous weapons. Examples of this are the atom-bomb tests that were made in the deserts of New Mexico and Nevada.

*This page is for your own notes and illustrations*

Second of a Series on

DESERT LIFE

# WHAT IS A DESERT?

*by*

ANNE STROMQUIST

*Raymond Foundation*

Museum Stories, Number 246

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## What Is a Desert?

To most people the desert is a vast sea of sand piled in great dunes under a blazing sun, but many deserts are not like this at all. In some deserts the sand has been blown away by winds, leaving a stony pavement of pebbles and fragments of rock. In other deserts strange wind-carved rocks, buttes, or mesas tower above the plain.

All deserts have one thing in common. They are places where there is a scarcity of water. More water is lost by evaporation than is received as rain. Often the air is so hot and dry that much of the rain dries up as it falls and never reaches the ground. Some of it, however, does sink into the earth to replenish the underground water. This water appears at the surface in some places in springs. In such spots plants can grow, making fertile green islands called oases, where people sometimes settle.

The rain that is so scarce in the desert cannot be depended on or predicted. When showers do come they are often so violent that they cause flash floods that damage roads and bridges and are a threat to travelers. French soldiers in the Sahara are forbidden to pitch their tents in dry ravines overnight although the ravine walls give shelter against very unpleasant winds. A sudden cloudburst might cause a raging torrent to sweep through the ravine, destroying everything in its path.

During the summer, temperatures of around 110 degrees are very common in the desert. The highest temperature ever recorded anywhere in the world was in the Sahara, when a reading of over 136 degrees in the shade was taken.

The highest temperature ever recorded in the United States was 134 degrees, a reading made in Death Valley in the California desert. Although the summer nights in the desert are a relief from the intense heat of the day, they could not be called cool. During the winter the days are still warm and sometimes reach a temperature of 80 degrees. The winter nights, however, may be quite chilly and there may be occasionally a little frost.

The great heat of the desert is the cause of reflections called mirages. Perhaps you have noticed rather wavy heat lines above smooth pavements and asphalt roads on very hot days in summer. In the distance on heated roads you can see reflections that look like pools of water. Travelers in the desert often are fooled by the same kind of unreal pools and trees that seem to be oases where there are none. They are mirages. The heating and thinning of the air above the very hot sand of the desert causes mirages when the air is still.

Many days in the desert are calm, but most days are quite windy. Because of strong prevailing winds in most desert areas, the air is often murky with fine dust that fills eyes, nose, and throat and makes travel very uncomfortable and sometimes impossible.

The strong desert wind commonly piles the loose sand into great ridges called dunes. The dunes are blown constantly by the wind, and they move slowly across the land. The weaker winds make ripple patterns on the sand. Heavy rock particles, blown along close to the ground, carve and etch the surface of the desert.

Through action of the wind and changes in temperature the rock in desert regions breaks up very slowly into sand or soil. The soil is often blown away because there are no plants to hold it down. Desert soil, however, is very rich in minerals because they have not been washed away as they are in the regions of heavy rainfall. If water could be brought to some of the dry regions of the world, which has already been done in a number of places, then hundreds of thousands of square miles of uncultivated land would be made into useful farm-land.

*This page is for your own notes and illustrations*

Third of a Series on

DESERT LIFE

# HOW PLANTS LIVE IN THE DESERT

*by*

MARIE SVOBODA

*Raymond Foundation*

Museum Stories, Number 247

March 21, 1953

## How Plants Live in the Desert

Deserts usually have less rain, more wind and sun, and often higher temperatures than other parts of the world, but the one thing that all deserts have in common is a scarcity of rain water. Because of this, desert plants must make certain adjustments in the way they live.

Not every plant can grow and thrive in the desert. The plants that do are the ones that have been successful in adapting themselves to the desert's harsh environment. The most important characteristic of desert plants is their ability to withstand long periods of drought without dying. This is absolutely necessary because there are long periods of time between rainfalls.

Desert plants have adapted themselves to the lack of water in many ways. Almost all of them have modified their leaves, stems, and roots to save as much water as possible. If the plant has leaves, they are either very fine or very thick. The fine ones appear only after a rainfall and are shed early in the spring. The thick ones are covered with a "varnish," powdery scales, or hairs. Some desert plants have no leaves at all.

Ordinarily plants manufacture food in the leaves where the green coloring-matter (chlorophyll) is located. At the same time much water evaporates through the tiny pores of the leaves. In leafless plants, therefore, food-making (photosynthesis) takes place in the thickened green stems. The stems of desert plants are especially tough and grow very slowly. The sap inside the stems is thick and gluey,

and this sap enables the plant to resist wilting or drying because thick sap dries slowly. Desert plants often have modified roots. To reach water far below the surface some desert plants rely on long deep roots. Others have shallow root-systems that spread over a large area to absorb every bit of available moisture. Sometimes the underground root-system may cover an area several times larger than that covered aboveground by the plant.

All deserts have some plant life. Even the Sahara in Africa with its constantly shifting sand has occasional oases where grow a wide variety of plants. Such fertile places occur because underground streams flow fairly close to the surface and provide water.

Desert plants are divided into two large groups: herbs, plants with non-woody stems, and shrubs and trees, plants with woody stems. Many of the herbs are annuals; that is, they are plants that mature, produce their seeds rapidly, and die, all in one season. Annuals waste very little energy in growing stems and leaves. Most important are the seeds. When the seeds are produced they drop into the sand and remain buried until winter rains fall more heavily than usual. The seeds of desert annuals are responsible for the carpet of blooms that magically covers the desert for a few days in the spring and then disappears.

Other desert herbs are perennials; that is, they are plants that survive from one season to another. The active period of growing for perennials is followed by a "quiet" period. Then leaves are shed and most of the living plant is underground until the next year, when the plant again flourishes.

The shrubs and trees of the desert survive from year to year because their great root-systems penetrate deep into the soil for water. Where water is very scarce the shrubs and trees may be no higher than a man's knees, but where water is plentiful they may reach sizable heights. The dull gray-green of the shrubs and trees makes the desert look uninteresting. Yet the monotonous color gives no clue to the bright and beautiful colors that the desert can display at certain times.

*This page is for your own notes and illustrations*

Fourth of a Series on

DESERT LIFE

# THE DESERT'S MAGIC CARPET

*by*

MARIE SVOBODA

*Raymond Foundation*

Museum Stories, Number 248

March 28, 1953

## The Desert's Magic Carpet

Deserts of our Southwest produce some of the world's most unusual plants. Certain plants, particularly cacti, are always associated with deserts, but cacti belong almost entirely to the New World. In Arizona alone there are about one hundred kinds of cacti. Cacti are found throughout our arid Southwest, although they are abundant only in those places where water is seasonably plentiful.

Certain adaptations made by the cactus enable it to get along without much water. The sahuaro, the largest cactus, rises to a height of forty-five feet. It stores a tremendous amount of water in its stem. Water frequently is seventy to ninety per cent of the plant's entire weight. After a fairly wet season a sahuaro may contain nearly thirty tons of water.

This huge column-like plant has a ribbed surface with grooves and ridges that are elastic and capable of spreading and contracting like an accordion. During a rainy period the stem swells as the storage tissues absorb more and more water. Soon the stem becomes almost smooth. As the sahuaro uses the stored water, the stem shrinks and the ridges move closer together. The sahuaro may live for about three years without a drop of water.

The barrel cactus is well known to travelers in the desert because its water supply can be tapped and safely used by people. By scraping out some of the pulp and squeezing it in a cloth, a small amount of drinkable water may be obtained. Although the water has a bad taste, it will do in an emergency.

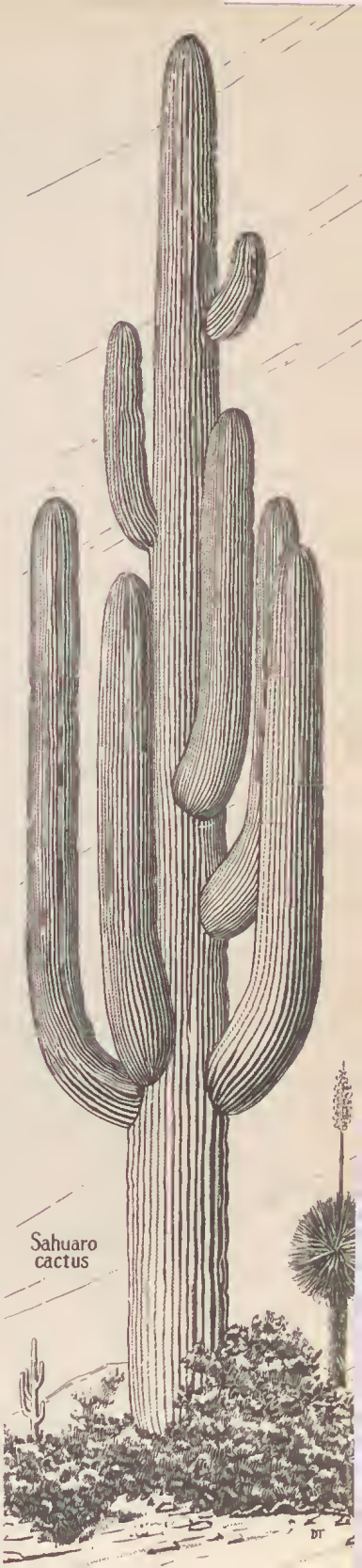
One of the most fantastic of desert plants is the Joshua tree, which is, strangely enough, a member of the lily family. When it is young, it grows rather straight and produces a ragged crown of branches at its top. As the Joshua tree grows older, its branches twist into weird forms and sag toward the ground. In the spring, if the winter rains have been heavy, the Joshua tree bursts into bloom, bearing thick clusters of large greenish-white flowers. Each flower may measure two inches across.

Creosote is a common shrub of the desert. In some regions it is the only form of plant life. Its wide-spreading root-system so completely drains the water from the soil that other plants cannot survive in its vicinity, and this accounts for its regular spacing. An area of creosote bushes looks like an orchard of dwarf trees. The dark-green leaves are covered with a resin that gives the entire plant a pleasant peppery smell.

Mesquite grows only where groundwater is available. When it grows in dry stream beds, that is a sign of wet sands not far down. Mesquite was held in high favor in the early years of our country's history by people traveling westward. Its leaves and pods provided food for animals and men.

Many desert plants of the Southwest belong to the pea family (all members of the pea family are called legumes). Like the mesquite, the ironwood is a member of the pea family. Ironwood, the desert's tallest tree, is twisted and grotesque in appearance. Its pods can be used as food. The smoke tree, another member of the pea family, has a mass of slender gray branches that look just like suspended smoke.

Desert regions in certain parts of the West have been irrigated with great success. Where formerly only cactus, sagebrush, and creosote grew, now are orange and lemon groves. Irrigation has proven to be one of the keys to the desert's treasures, but this key must be used with caution.



*This page is for your own notes and illustrations*

Fifth of a Series on

DESERT LIFE

# DESERT INSECTS AND REPTILES

*by*

NANCY WORSHAM

*Raymond Foundation*

Museum Stories, Number 249

April 4, 1953

# Desert Insects and Reptiles

The desert often seems barren, but really it is the home of many interesting creatures. All desert animals as well as plants must adjust to desert conditions. Problems of the desert are all ones of extremes—too much heat, too little water, and too much light.

Some insects, such as moths and butterflies, meet long periods of dryness by going into "summer sleeps" called aestivation. This is similar to hibernation, but it is an escape from dry rather than cold weather. Moths are able to aestivate for more than two years in either cocoon or egg. When there is enough moisture to support their food-plants, the caterpillars and winged adults appear. Indeed, timing is so perfect that some desert plants depend upon moths to carry pollen from one bloom to another.

Particularly those insects living on or near the ground are colored to match the sands and rocks upon which you find them—tan, gray, pale green, or yellow. Many are covered with a wax-like "skin" to prevent loss of moisture to the air. Such insects excrete no liquids. They get water from food, or some depend on water made in their own bodies by changing fat or starch to energy.

Some insects are well adapted for burrowing in the sand to escape the hot sun and their enemies or, in the case of the ant-lion larva, to get food. It lives at the bottom of a pit-like trap dug in dry sand where it lies entirely covered by sand waiting for ants to fall into its trap. These little desert insects are found any place that dry sand and ants are found—even in Chicago in sandy spots under porches where nothing grows.

Other insects, such as grasshoppers and crickets, are blown by strong winds and fly on strong wings in huge swarms, eating everything in sight, stripping fields, and even invading houses and eating clothing and curtains. Desert insects would overrun the world if it were not for insect-eating animals. Chief among them are other insects and reptiles.

HORNED LIZARD

such as lizards and snakes. Desert reptiles are seldom seen during the heat of the day. They are either nocturnal or out only in the morning and late afternoon.

The numerous lizards are fitted to this type of home. They, too, match their surroundings. Some move so swiftly over the hot surface of the ground that it is hard for the eye to follow them. Then they suddenly "freeze" and disappear against their background. When being chased, many lizards can shed wriggling bits of their tails to distract their enemies. Where the desert is sandy, walking is usually difficult, and so many of these animals have fringes on their toes to keep their feet from sinking.

Some lizards in widely scattered parts of the world are covered with scales or spines that serve as protection from various enemies. One such lizard wrongly goes by the name "horned toad." Another form of protection is inflation. The animal blows itself up like a balloon so that it can tightly seal itself in holes in the rock or become too large a mouthful for smaller enemies. There is only one of our desert lizards that is poisonous—the slow-moving, brightly colored Gila monster. Even this lizard uses its poison more to secure food than for defense.

Contrary to popular belief, snakes are not numerous in the desert. In fact there are only three kinds in North America entirely limited to sand deserts. They have modifications for living in sandy areas. The sidewinder, a type of rattlesnake, moves over the hot sand with a sideways looping motion, only touching the ground at two small spots at a time. All desert snakes have overlapping scales to aid in moving through sand and some have wedge-shaped heads with jaws on the underside to help them "swim" through the sand without getting it in their mouths.

A few tortoises are found in the desert. The gopher tortoise lives in deep burrows. When it gets a chance to drink, it can increase its weight by forty per cent. The water is stored for long periods in the animal's body.

These animals have all shown a number of special ways of living because of their hot dry home. Do you think you could manage to live in the desert?

*This page is for your own notes and illustrations*

Sixth of a Series on

DESERT LIFE

# DESERT FUR AND FEATHERS

*by*

NANCY WORSHAM

*Raymond Foundation*

Museum Stories, Number 250

April 11, 1953

## Desert Fur and Feathers

The desert is home to many small animals of the rodent family. This includes all desert mice, rats, prairie dogs, gophers, and ground squirrels. Rodents are able to get along better than other animals in desert regions because they are burrowing animals that live on seeds and grasses. Like some other desert animals, they are not dependent on fresh drinking-water. They live on water in their food and on water made by digesting fats and starches.

Burrowing rodents often scurry rapidly from one bit of cover to another for protection. Some of them, like the jumping mouse, the grasshopper mouse, and the kangaroo rat, have long strong hind-legs and can hop or jump great distances. Many rodents live in colonies—"towns" with underground tunnels and storage rooms for food gathered in season. The desert hares and cottontails are like the rodents in most of their living habits.

Rodents are the main food-supply of animals like the cunning little kit-fox and its Sahara cousin, the desert fox. Another relative of the fox is the coyote. It is known by its call from a ridge or hilltop. Coyotes on distant hills answer, and a stranger to the desert may be frightened by this moonlight serenade.

Other animals that feed on rodents and insects are wildcats, badgers, and skunks. Shy desert hunters are seldom seen because most of their roaming is done at night. Only the black-and-white skunk, with its unpleasant perfume as protection, is easily seen. But the largest American desert animal is not a hunter. It is the graceful prongbuck, sometimes called pronghorn antelope. It is not a true antelope and so the other name is preferred. True antelopes live in the Old World only. Prongbucks roam the desert in herds, searching for food and water. They are

PRAIRIE DOGS

GOLDEN EAGLE

fitted for desert life because they can do without water for long periods. If an enemy is seen more than a mile away, the prongbuck "freezes" and blends with its surroundings in hope that it will not be noticed. If the prongbuck is seen, it will bound from sight at great speed. High above the desert a tiny speck soars on silent wings, glides, and swoops earthward. It is an eagle seeking its breakfast. The eagle is only one of the large desert birds that solve the problem of food and water by flying unbelievable distances on strong wings. Although the eagle nests on high mountain crags, it is often found searching the desert wastes for unwary game. Like its lesser cousins, the falcons and hawks, the eagle eats snakes, mice, rabbits, and, in fact, any animal it can overpower.

Other desert birds have developed long powerful legs to run rapidly over the hot ground, but they have lost the power of flight. One, the burrowing owl, flies weakly and seeks refuge in dens of rodents. Another, the roadrunner, is so named because it can be seen racing along paths and roadways. The ostrich is a flightless running bird that lives in the Sahara Desert.

Desert birds are well adapted to dry conditions. They get water from berries, insects, snakes, and lizards. With few exceptions they match their surroundings remarkably well. Some tiny birds of the chickadee, sparrow, and wren families have learned to use plant thorns for protection. The most common of these birds, the virdin, builds a nest even larger than a football from twigs and thorns.

Both the furred and feathered animals of the desert have a number of ways of fitting to desert life. Among these are keen sight, protective coloration, rapid and prolonged movement, burrowing habits, and water conservation. How well do you think you could adapt to the desert?

*This page is for your own notes and illustrations*

Seventh of a Series on

DESERT LIFE

# NOMADS OF THE DESERT

*by*

HARRIET SMITH

*Raymond Foundation*

Museum Stories, Number 251

April 18, 1953

## Nomads of the Desert

No people make the true desert their home. But many tribes have learned to travel across the sand wastes in safety and to make a living on the sparse pastures along the margins of the barren wind-swept desert regions.

Wherever there is even a little extra moisture, wild plants quickly sprout and, by moving their flocks and herds through the seasons to pastures renewed by rains, desert herdsmen manage to find food for their livestock. Water is all-important: rain water to keep the patches of scrubby brush and grass alive and water at wells and springs for people and their domestic animals to drink.

In most of the almost-desert regions of the world—whether around the great "Dry Sea" (Gobi Desert of Asia), the Kalihari of South Africa, North Africa's Sahara, in Arabia, or in our own Southwest—you'll find tribes making a living by herding. You'll not find these herdsmen living in towns but in small, widely scattered family groups. They'll be dressed to keep off the sun's fierce rays. Their belongings will be things readily packed up and carried in the frequent moves to greener pastures. Always in the mind of the herdsman is the uncertainty whether each season's water and grass may mean life or death for his food-animals and thus for him and his family.

Arab camel herders make a living on pastures so dry and bare as to be considered real desert-land by the herders of sheep and goats. A camel, you see, stores a reserve food-supply of fat in its hump on which it can live for many days if pastures give out, and, if it is finding plenty of fresh green plant-food, a camel doesn't have to be taken to a water hole for a month. Then it may drink (and store up in its body) as much as seventy quarts of water at a time. Sheep and goats have to drink every three days, and so their shepherds must stay near places with a permanent

water-supply, far out from the center of the Arabian Desert. In such places, shepherds may even settle down in villages for part of the year to plant a few crops.

But Bedouin camel-herders are nomads, migrating from one dry pasture to the next in bands of fifty to one hundred people, mostly relatives. In seasons of more rain and, therefore, greener pastures, more bands can camp together under the leadership of the sheik of the tribe, but in times of drought and during the August heat and sand-storms the bands must again scatter to set up their separate camps of a half-dozen or so big black tents.

The nomads themselves look a little like walking tents in their heavy loose clothing. Their robes and headcloths give insulation from the intense sun and sandy winds and at night furnish warmth when the temperature drops to near freezing after a daytime high of around 120 degrees.

The famous Arabian horses are a treasured luxury, but camels are the real wealth and security of a family. You probably would find camel meat pretty strong-tasting and tough, and yet to the Bedouin this is the special dish reserved for feasts—camels are too valuable to butcher for everyday meals. Camel's milk is a main food. Camels transport the camp. Camels even help to supply shelter, for their hair, mixed with that of goats, is woven into the heavy black cloth of the tents.

Women spin the yarn while on the march and in camp weave narrow strips of black cloth on a small, easily transported loom. It takes a lot of these two-foot-wide strips sewed together to make a tent thirty feet across and twelve deep. This tent shelters the whole family. Yet, big as it is, it can quickly be folded in fourths lengthwise and rolled up from either end around a tent pole into a double bundle to fit over the back of a burden-camel.

Almost every day the band packs up and travels ten or fifteen miles to a fresher pasture, hurrying to get the tents set up as shelter from the intense heat of the afternoon sun. The land of Arabia is actually named for these typical nomad people, for "Arab," in the Arabic language, means both "desert" and "inhabitant of the desert."

*This page is for your own notes and illustrations*

Eighth of a Series on

DESERT LIFE

# INDIANS OF NORTHERN ARIZONA

*by*

HARRIET SMITH

*Raymond Foundation*

Museum Stories, Number 252

April 25, 1953

# Indians of Northern Arizona

Northern Arizona, between Mexico's Sonoran Desert and the Great Plains rangeland, is spoken of as desert country although this is no barren sand-waste but a sunny colorful land. Red and gold layers of rock rise in steep hills, called mesas (Spanish for table), above a high plateau of reddish earth—soil that would be covered with forest and grass if more rain fell on it. At the base of the mesas, underground water from the winter snows flows out as springs. Here, by means of irrigation, skillfully using this little extra water, Hopi Indian farmers grow their cornfields and gardens. This secure food-supply makes it possible for many families to live together in villages that were named pueblos by the Spanish explorers.

Wood is scarce, of course, and is saved for roof beams of the flat-topped houses. The thick walls are built of stone and mud from the desert itself. Settlers from eastern cities have found these flat adobe houses so cool and well suited to the hot dry climate of the Southwest that they copy the Indian buildings.

When you visit a Hopi pueblo on top of its steep rock hill, you learn that it was built there hundreds of years ago. Each town was crowded on the very tip of its mesa where it could be most easily defended from the raids of neighboring desert tribes, who could not grow corn but liked to eat it. The farming Indians solved the problem of limited building space in the ancient days by building two- and three-storied apartment houses in caves in the cliffs, and when they moved to the narrow mesa-tops they continued this citified method of crowding several families on top of each other to save space.

Hundreds of families live in an area several blocks square, fed by those clusters of green fields at the base of the mesa. Looking back from your camp at the edge of Hopi country, you think that you've left behind all human life concentrated in a sort of oasis at each mesa village. In all other directions you see only a vast dry land with its scattered patches of wild desert plants.

And then at dusk, far out, you hear a Navaho shepherd's homecoming chant. You look in that direction and notice a plume of smoke coming out of the top of a mound you had mistaken for part of the desert landscape. Several miles farther away a square of firelight marks the door of another hogan, the one-room, one-family home of the Navaho. Only then do you realize that out on the desert, too, there are people—shepherd families living as widely scattered as the desert vegetation that supports their flocks.

Early the next morning you'll ride close to the earth-covered hogan in time to watch the father and older son start out with the sheep and goats. Mother and girls are busy cooking and weaving in the shade of an open shelter roofed with evergreen boughs. July seems a strange time for everyone to be wearing heavy long-sleeved blouses of velveteen, but you soon learn that human skin needs a covering to protect it from the hot dry air and fierce sunshine of the desert.

Navahos used to dress in deerskins and heavy hand-woven cloth, but now they trade the rugs and silver jewelry they make for store goods. Moccasins with strong rawhide soles protect feet that must walk many miles over the hard-baked rocky land following the grazing herds. As the season gets drier, the shepherds may have to camp for days far from home, but always the hogan is headquarters, the one fixed spot in the lives of a half-nomadic people.

Side by side in our Southwest are these two patterns for human living in semiarid lands: shepherds scattered with their flocks throughout the sparse wild pastures, and settlements wherever a little extra water can be used by industrious farmers to turn the desert earth into garden spots.

*This page is for your own notes and illustrations*